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UNITED STATES PATENT APPLICATION

OF

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FOR

MOBILE CACHE FOR DYNAMICALLY COMPOSING USER-SPECIFIC INFORMATION

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TECHNICAL FIELD

The present invention relates to caching, and more particularly to a cache that handles both static and dynamic data.

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BACKGROUND OF THE INVENTION

Wireless Application Protocol ("WAP") enabled services are currently becoming more popular as more users incorporate wireless devices into their daily lives. As is known in the art, WAP is a standardized way for wireless devices (e.g. portable phones, hand-held devices) to communicate with each other and to access the Internet.

Caches are widely used in many applications to improve processing speed by providing a location for temporary data storage. For example, the cache can store recently accessed Web pages so that, when the user later returns to the Web page, the browser obtains the Web page information locally from the cache rather than from the origin server.

The information from the cache reaches the user faster and also relieves the network from the burden of the additional traffic that would have occurred if the Web page information had to be re-transmitted to the wireless device.

Currently known-caching schemes in wireless applications, however, can deal only with static data and cannot generate any information according to user-specified parameters. As a result, there are no known ways of 5 providing personalized information delivery with existing cache systems.

There is a need for a cache system that is not limited to handling static data and that can handle and generate dynamic user-specific information.

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SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a mobile cache system and method for Wireless Application Protocol ("WAP") enabled services. The inventive mobile 15 cache system not only can cache static data, but also can share processing functions with origin Web servers and facilitate dynamic creation of user-specific information.

A mobile cache server according to the invention obtains a user profile, which contains preference data with 20 respect to output content and layout, looks for user-requested information in an object database, fetches and caches the information from an origin server if the information is not already in the object database, and

composes user-specific information according to the preference data.

As a result, the inventive system and method caches static data like known caches but also shares data 5 processing functions with origin Web servers and allows dynamic creation of user-customized information. By dynamically generating information as well as caching static pages, the invention reduces traffic burden on the original server while providing users with personalized, 10 user-specified information service.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a schematic diagram of a mobile cache system architecture incorporating one embodiment of the 15 present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 is a representative diagram of a mobile cache system architecture incorporating the mobile cache of the 20 present invention. As indicated in the Figure, the mobile cache 100 is particularly suited to a system using Wireless Application Protocol ("WAP") enabled services and is designed to improve the experience of wireless device (e.g.

wireless phones, hand-held devices) users during Internet access. As can be seen in the Figure, a wireless device 102 couples to the mobile cache 100 via a mobile network 104 connected to a WAP proxy server 106. The WAP proxy server 106 is connected to the mobile cache 100 and directly to the Internet 108, which include Hypertext Markup Language ("HTML") servers 110, WAP servers 112, and/or neighbor caches 114. The term "origin server" will be used in this application to refer to any location from which the mobile cache 100 obtains its original data, such as the Internet 108.

The mobile cache 100 itself preferably includes an object repository or database 116 that caches selected data from the origin server, such as recently accessed Web pages. The mobile cache 100 also includes a user profile database 118 and a dynamic information composer 120. The user profile database 118 stores one or more user profiles that contain output preference data. The output preference data may include data specifying the content and layout of the information fetched from the object database 116 when it is delivered to the user via the wireless device 102. When the mobile cache 100 receives a user request for specific information from the Internet 108, it first looks

to the user profile database 118 to obtain the user profile associated with the user making the request. If the user's profile is not available in the database 118, the mobile cache 110 may either display the fetched information using 5 standardized content and formatting or request additional information from the user to generate a new user profile to be stored in the user profile database 118.

Once the mobile cache 100 receives a user request and obtains the user profile from the user profile database 10 118, the mobile cache server looks for the requested information in the object database 116. If all of the requested information is located in the object database 116, the dynamic information composer 120 uses the requested information to compose user-specific information 15 according to the user's preferences with respect to content and layout. The information is preferably composed in Wireless Markup Language ("WML") in real time. The user-specific information is then outputted to the wireless device 102 for the user's consideration.

20 If the object database does not contain all of the requested information and if the missing information is not available in local or neighbor caches, the mobile cache 100 will declare a cache miss and pass the user request to the

origin server so that the information can be fetched from the origin server (e.g., the Internet 108) and then stored in the object database 116. The dynamic information composer 120 then composes the user-specific information in 5 the manner explained above, according to the user's preferences with respect to content and layout specified in the user profile. As the dynamic information composer 120 generates the user-specific information and caches static pages, the mobile cache 100 may locally maintain logs that 10 can be appended to log files of origin servers.

As can be seen in Figure 1, the mobile cache 100 may also include a change-based trigger 122 that monitors information changes in the object database 116 and triggers information delivery, according to user preferences, when 15 the amount of changed information reaches a predetermined threshold. This monitoring and triggering preferably occurs even while the dynamic information composer 120 is composing user-specific information.

The mobile cache 100 according to the present 20 invention also may include an image converter 124 and/or a document converter 126. The image converter 124 can be used alone if the mobile cache 100 is constructed to function in its simplest mode. Caching image objects

improves performance by saving a great deal of network bandwidth. Because the small screens in wireless devices, such as phones and hand-held devices, have difficulty rendering the image objects that are often attached to HTML files, the image converter 124 converts the image objects so that they can be viewed by WAP-enabled devices before they are cached into the object database 116.

The document converter 126 can be included to create an advanced operating mode for the mobile cache 100 by being able to extract data segments from single or multiple Web pages to provide further dynamic information composition capability. The document converter 126 takes advantage of XML-based content tagging by converting the HTML files obtained from the origin server into Extensible Markup Language ("XML") files and storing them in the object database. The XML files, including their content-based tags, can then be queried by the mobile cache server based on the user's information request so that selected data segments from the XML files can be used to dynamically compose the user-specific information. By taking advantage of the XML-based content tags, the mobile cache 100 can customize the user-specific data at an additional level of detail. Of course, if the data from the origin server is

already a WML file, the WML file can be transmitted directly for storage in the object database 116 without first passing through the image converter 124 or the document converter 126.

5 Thus, the inventive mobile cache system is particularly suited for wireless application protocol (WAP) services and can be incorporated for use with WAP proxy or Web servers. Caching satisfies user information requests without having to access the origin server, reducing
10 network bandwidth and reducing traffic load on origin servers. Further, by combining caching with dynamic information composition/transformation and providing the option of converting existing HTML applications for use on WAP-enabled services, the inventive mobile cache system can
15 provide personalized WAP service and improved network and server performance at the same time.

It should be understood that various alternatives to the embodiments of the invention described herein may be employed in practicing the invention. It is intended that
20 the following claims define the scope of the invention and that the method and apparatus within the scope of these claims and their equivalents be covered thereby.